

UV Radiation Testing of Space Suit Materials

Completed Technology Project (2016 - 2016)



Project Introduction

Human missions to Mars may require radical changes in our approach to EVA suit design. A major challenge is the balance of building a suit robust enough to complete multiple EVAs in the dirt under intense UV exposure without losing mechanical strength or compromising its mobility. Promising new materials—including dust repellent fabrics—have been identified as potential solutions, yet none of these have been tested in realistic UV environments to characterize their viability going forward. We will conduct ground testing on new materials to determine performance degradation after exposure to Mars mission equivalent UV and compare the results to control materials matching those currently used on the EMU. This will mature the material technologies and provide performance data that can be used by not only the space suit development teams but for all Mars inflatable and soft goods derived structures from airlocks to habitats.

The following will be required to complete this testing: Select materials according to their prominence on the current EMU and advanced space suits such as Z-1 and Z-2. Materials will be tensile testing and mass measurements taken at Johnson Space Center. They will be radiated with Mars equivalent UV at Marshall's environmental test facilities. DUV Raman spectra will then be taken at the Jet Propulsion Laboratory. Complete Raman spectra, mass measurements, and tensile testing of pristine samples. Radiate samples with the Martian radiation environment. Complete DUV Raman spectra, mass measurements, and tensile testing of degraded samples. Evaluate the materials based on Raman spectra, mass, and tensile test data of the samples before and after radiation. Correlate how spectra data behaves when compared to mass and tensile test data.

Anticipated Benefits

N/A



UV Radiation Testing of Space Suit Materials Technology Showcase 2016 Project Poster

Table of Contents

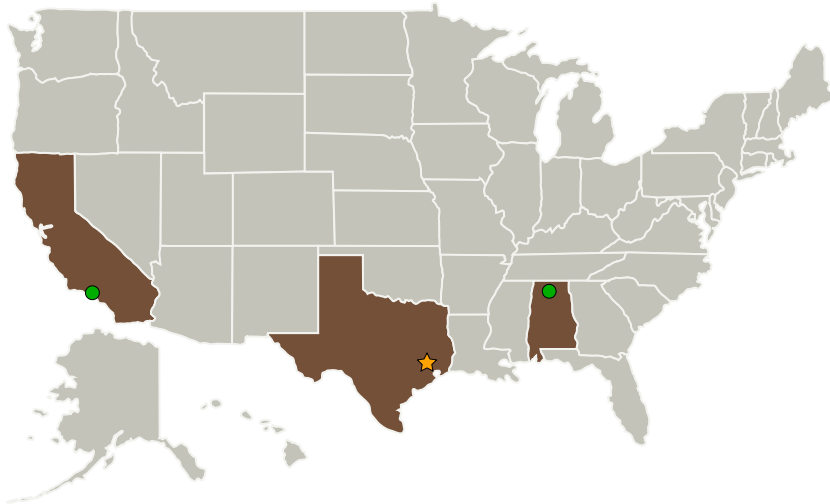
Project Introduction	1
Anticipated Benefits	1
Primary U.S. Work Locations and Key Partners	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	2
Images	3

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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California
● Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	California
Texas	

Organizational Responsibility

Responsible Mission Directorate:

Mission Support Directorate (MSD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Center Independent Research & Development: JSC IRAD

Project Management

Program Manager:

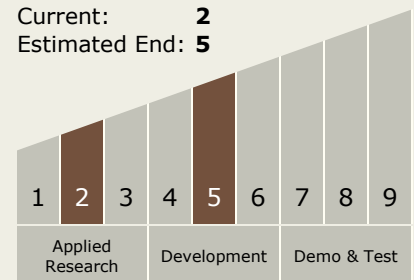
Carlos H Westhelle

Principal Investigator:

Kristine N Davis

Technology Maturity (TRL)

Start: 2
 Current: 2
 Estimated End: 5



Technology Areas

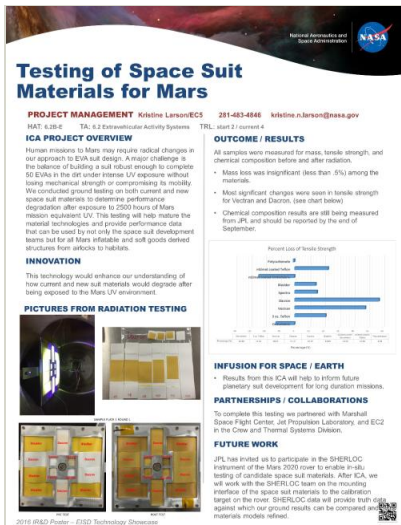
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Images



UV Radiation Testing of Space Suit Materials

ProjectUntitled Image 1

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(<https://techport.nasa.gov/image/26145>)

Technology Areas (cont.)

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - TX12.1 Materials
 - TX12.1.1 Lightweight Structural Materials